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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/651,620	08/30/2000	Eugene P. Marsh	4218US (99-0796)	1130

7590 06/04/2003  
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P O Box 2550  
Salt Lake City, UT 84110

EXAMINER

VU, HUNG K

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 06/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/651,620

Applicant(s)

EUGENE P. MARSH

Examiner

Hung K. Vu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 February 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-5 and 7-66 is/are pending in the application.
- 4a) Of the above claim(s) 9 and 21-58 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10-20 and 59-66 is/are allowed.
- 6) ☒ Claim(s) 1-5, 7 and 8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 12, 13.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

### DETAILED ACTION

1. Applicant's terminal disclaimer filed 07/03/01 has been considered by the examiner. The arguments advanced therein are persuasive with respect to the rejections of record, and those rejections are accordingly withdrawn. In view of a further search and consideration, however, a new rejection is set forth further below. This action is not made final.

#### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kirlin et al. (PN 6,320,213, of record).

Kirlin et al. discloses, as shown in Figures 2 and 24, a method for forming a semiconductor device structure comprising,

providing a semiconductor substrate assembly (102,104) having a surface;

forming a diffusion barrier layer (108) over at least a portion of the surface, wherein the diffusion barrier layer comprises  $\text{RuSi}_x\text{O}_y$  [Col. 4, line 67, Ru-Si-O].

Kirlin et al. does not disclose the diffusion barrier layer is formed by chemical vapor deposition or by atomic layer deposition. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the diffusion barrier layer of Kirlin et al. by

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chemical vapor deposition or by atomic layer deposition as a matter of obvious design choice since applicant has not disclosed that the above technique(s) solve(s) any stated problem or is for any particular purpose and it appears that the invention would perform equally well with any other applicable techniques may used

With regard to claim 2, Kirlin et al. discloses forming the layer of  $\text{RuSi}_x\text{O}_y$  where x is in a range of about 0.01 to about 10 [Col. 4, line 67, Ru-Si-O].

With regard to claim 3, Kirlin et al. discloses forming the layer of  $\text{RuSi}_x\text{O}_y$  where x is about 0.4 [Col. 4, line 67, Ru-Si-O].

With regard to claim 4, Kirlin et al. discloses forming the layer of  $\text{RuSi}_x\text{O}_y$  where y is in a range of about 0.01 to about 10 [Col. 4, line 67, Ru-Si-O].

With regard to claim 5, Kirlin et al. discloses forming the layer of  $\text{RuSi}_x\text{O}_y$  where y is about 0.05 [Col. 4, line 67, Ru-Si-O].

With regard to claim 8, Kirlin et al. discloses forming the layer of  $\text{RuSi}_x\text{O}_y$  comprises three to five monolayers of  $\text{RuSi}_x\text{O}_y$  [Col. 4, line 67, Ru-Si-O].

***Allowable Subject Matter***

3. Claims 10-20 and 59-66 are allowed.

4. The following is an examiner's statement of reasons for allowance:

Applicant's claims 10-20 and 59-66 are allowable over the references of record because none of references disclose or can be combined to yield the claimed invention such as the method for forming a  $\text{RuSi}_x\text{O}_y$  barrier layer by forming a layer of ruthenium relative to a silicon-containing region and performing an anneal in an oxidizing atmosphere to form  $\text{RuSi}_x\text{O}_y$  from the layer of ruthenium and the silicon-containing region, as recited in claim 10, the method comprising, placing a semiconductor substrate assembly in a reaction chamber, the semiconductor substrate assembly having a surface; introducing a ruthenium precursor into the reaction chamber to form a single layer of ruthenium on at least a portion of the semiconductor substrate assembly surface; introducing a nonreactive gas into the reaction chamber to substantially cover the single layer of ruthenium and purge the ruthenium precursor from the reaction chamber; introducing a silicon precursor into the reaction chamber to form a single layer of  $\text{RuSi}_x\text{O}_y$  on at least a portion of the semiconductor substrate assembly surface; introducing a nonreactive gas into the reaction chamber to substantially cover the single layer of  $\text{RuSi}_x\text{O}_y$  and purge the silicon precursor from the reaction chamber, as recited in claim 59.

### ***Conclusion***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (703) 308-4079. The examiner can normally be reached on Mon-Thurs 7:00-4:30, alternate Friday 7:00-3:30, Eastern Time.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Vu

May 30, 2003

Hung Lu